



## D4.3 PILOT PROJECT APPLICATION REPORT UNITED KINGDOM

### PILOT 2 – DUNDEE CITY COUNCIL



## QualitEE Project

This document has been developed as part of the "QualitEE – Quality Certification Frameworks for Energy Efficiency Services" project supported by the EU's Horizon 2020 Programme.

The QualitEE consortium comprises 12 partner organisations covering 18 European countries, an expert advisory board, including the European standards body CEN/CENELEC, and 59 supporters from major financial institutions, government bodies, trade associations and certification bodies.

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## Disclaimer

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# 1 INTRODUCTION

During the Qualitee project activities, draft European technical quality criteria for Energy Efficiency Services<sup>1</sup> have been applied in pilot projects to provide critical feedback to feed into the adaptation of the criteria for the UK context, and to evaluate the feasibility of current proposals for a UK quality assurance scheme for EPC.

The project subject to the pilot exercise in this case is an Energy Performance Contracting project between Dundee City Council, the Client, and their selected Contractor, Vital Energi procured using the Scottish Government's EPC framework, the NDEEF. This document gives an overview of the project, as well as summarising the key outcomes and feedback from the process.

The author would like to extend thanks to all that participated in the pilot project and provided feedback; Alex Gibson and Andy Marnie from Dundee City Council, Chris Yeo from Vital Energi, Andrew Wholley from the NDEEF Project Support Unit (managed by Mott Macdonald), and Jamie Goth from the Scottish Futures Trust.

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<sup>1</sup> <https://qualitee.eu/publications/draft-guidelines-of-european-quality-criteria/>

## 2 DESCRIPTION OF THE PILOT PROJECT

### 2.1 Pilot project factsheet

#### Project details:

- 8 Public Buildings including leisure centres (sports facilities), ice rink, community centre, art gallery, library, depot and car park
- Project stage – M&V / completed
- Various efficiency measures including LED lighting, HVAC replacement / optimisation, pipe insulation and draught proofing
- Combined Heat and Power
- Renewable electricity from PV



**Table 1** Energy Consumption Data

Energy Consumption BEFORE intervention (actual) kWh/a	Energy Consumption AFTER intervention (actual) kWh/a	Value of planned EE investment £
19,213,530	17,001,895	£1.8m

#### Business case description/economic parameters

- Design & Build Energy Performance Contract with performance retention (12-month contract)
- £1.8m CAPEX

#### Stakeholders/companies involved

- Client – Dundee City Council
- ESCO – Vital Energi
- Facilitator – The Non-Domestic Energy Efficiency Framework (NDEEF) project support unit managed by Mott Macdonald, the Scottish Government and the Scottish Futures Trust

#### Overview:

Efficiency measures, CHP and PV for eight public buildings owned by Dundee City Council.

#### Annual carbon savings:

885.94 tCO<sub>2</sub> emissions per year

#### Annual energy savings:

2,211,635 kWh/year (12% energy savings)

#### Renewable generation:

121,962 kWh (Normalised PV Electricity)

#### Annual primary energy savings:

4,730,409kWh/year

## 2.2 Technical aspects

### Buildings identified for renovation and energy baselines

The first phase of the Dundee City Council NDEE project consisted of 8 buildings with a total floor area of 45,690 m<sup>2</sup>. The building usage types, and approximate ages are shown in the table below:

Site Name	Usage Type	Floor Area (m2)	Build Date
Olympia Leisure Centre	Leisure Centre Combined	5,400	2012
Dundee Ice Arena	Ice Rink	4,671	1980
Central Library	Library	8,810	1980
The Crescent	Community Centre	3,419	2014
Unit T Claverhouse	Depot	1,565	1990
DISC	Leisure Centre Combined (Dry)	3,768	2000
McManus Galleries	Museum / Art Gallery	5,022	1900
Gellatly Street Car Park	Car Park (enclosed)	13,035	1970

The site's Baseline Utilities consumption has been measured and shown in the following table:

Site	Total Annual Electricity Consumption (kWh)	Total Annual Fossil Fuel Consumption (kWh)	Total Annual Fuel Energy Consumption (kWh)
Olympia Leisure Centre	2,479,990	6,460,701	8,940,691
Dundee Ice Arena	2,192,023	2,075,513	4,267,536
Central Library	966,482	1,037,634	2,004,116
The Crescent	259,311	324,198	583,509
Unit T Claverhouse	185,481	254,292	439,773
DISC	470,676	775,920	1,246,596
McManus Galleries	334,447	1,085,801	1,420,248
Gellatly Street Car Park	311,062	-	311,062
<b>Total Baseline</b>	<b>7,199,471</b>	<b>12,014,059</b>	<b>19,213,530</b>

## Project scope

The following energy conservation measures were installed at the facilities:

Energy Conservation Measure (ECM)	Olympia Leisure Centre	Dundee Ice Arena	Central Library	The Crescent	Unit T	DISC	McManus Galleries	Gellatly Street Car Park
Vital View Optimisation*	✓	✓		✓	✓	✓	✓	
LED Lighting Upgrade	✓	✓	✓		✓	✓	✓	✓
Heating improvements	✓	✓	✓	✓	✓	✓	✓	
Ventilation improvements		✓	✓	✓	✓	✓	✓	
Cooling Systems	✓			✓	✓	✓	✓	
Pipework Insulation		✓	✓		✓	✓	✓	
Boiler & Burners	✓	✓					✓	
Ammonia Ice System**		✓						
Solar PV				✓	✓	✓		
Combined Heat & Power (CHP)		✓						
Building Fabric Works***		✓						

\***Vital View Optimisation** – Vital View is Vital Energi’s remote Building Management System optimisation service

\*\***Ammonia Ice System** - Improvements to existing ammonia ice chiller system including variable speed drives and associated control strategies for the cooling tower and glycol pumps.

\*\*\***Building fabric works** - replacement of external doors to reduce heat loss.



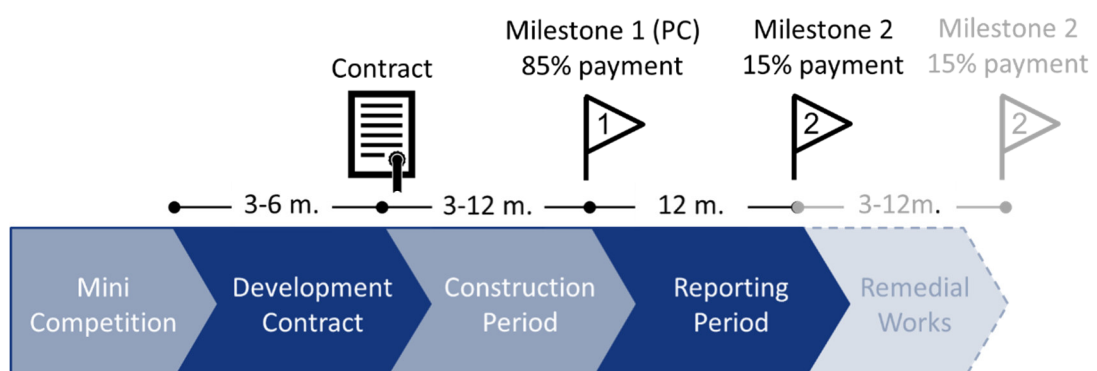
Photo. New LED lighting at Dundee Ice Arena

## Project implementation

- ✔ Project implementation took place over 7 months from December 2017 to June 2018.
- ✔ At the start of the project Vital Energi compiled a detailed project implementation plan
- ✔ Regular site meetings were held to ensure smooth delivery and that any concerns of the building users were addressed
- ✔ On completion of each Energy Conservation Measure, Vital Energi provided detailed Operations & Maintenance manuals along with training and handover. The contract was structured to transfer the majority of O&M responsibilities to the Client to fit into their existing maintenance regime.
- ✔ The only aspects of operations and maintenance retained by the Contractor during the 12 month contract (/retention period) were the Combined Heat & Power unit, the new modulating burners and the Vital View system.

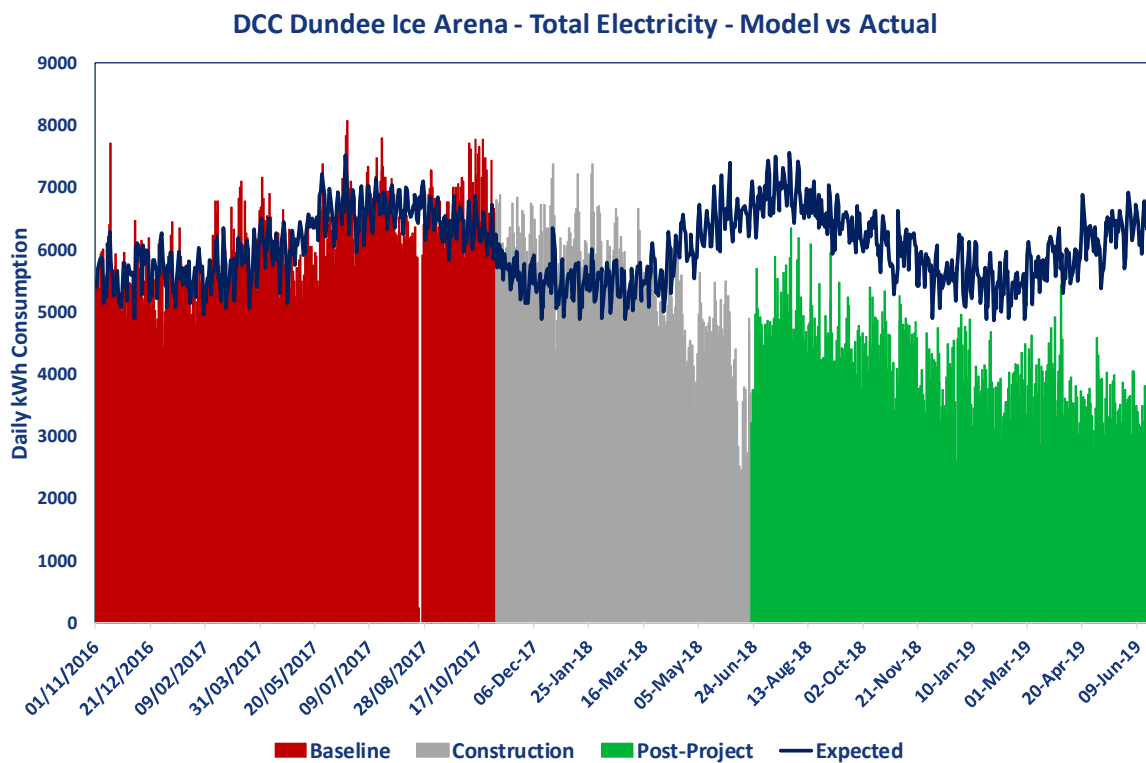
## Guarantee, measurement and reporting

- ✔ The Non-Domestic Energy Efficiency Framework (NDEEF) is the Energy Performance Contracting framework used by public sector bodies in Scotland. It was developed by the Scottish Futures Trust and is owned by the Scottish Government.
- ✔ NDEEF has two contracting variants; D&B and DBFM – the main difference being that DBFM includes a long term contract to operate and maintain the implemented ECMs, where the D&B variant limits the contract to a 12 months defects liability period in which the performance of the ECMs are proven.
- ✔ This project followed the D&B variant. This is structured similarly to a Design & Build contract but the retention value is increased materially (15% in this case), which is only paid out after it has been proven – through measurement & verification – that the guaranteed savings have been achieved. If the guaranteed savings are not proven in the 12 month reporting period following project completion, then the Contractor is required to perform remedial works to improve the savings level, which is then subject to further verification to prove that any shortfall in savings has been rectified.





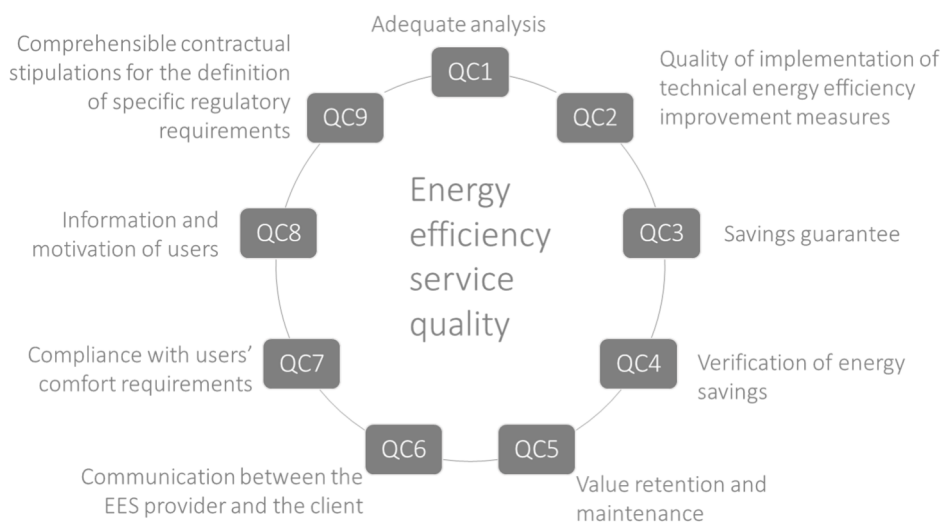
- ✔ NDEEF also requires that performance Measurement and Verification (M&V) is carried out by an independent M&V Professional. For this project an independent M&V Professional from EEVS Insight was selected.
- ✔ NDEEF offers a detailed M&V specification following the International Performance Measurement & Verification Protocol (IPMVP). The M&V Professional developed an M&V Plan following this specification, that was agreed between the parties and included within the contract. This M&V Plan included a variety of retrofit isolation and whole facility measurement approaches dependent on the scope of works at each site.
- ✔ Following practical completion in June 2018, there was a 12-month measurement period to evaluate the Contractor's performance against the guarantee.
- ✔ The Contractor provided monthly reporting, and a final savings reporting was provided by the Independent M&V Professional. An example of the reporting of whole facility electricity savings at Dundee Ice Arena is shown below:



- ✔ The final savings report demonstrated that the guaranteed savings level had been achieved so the contract was concluded. The Client and Contractor are currently in the reporting phase of a second EPC project.

### 3 FEEDBACK ON QUALITY CRITERIA

Feedback from pilot projects was collected in the form of a questionnaire. It contained identical questions for each quality categories and some open-ended questions to collect qualitative information. For closed questions a limited number of options were given, and respondents were asked to evaluate quality criterion category separately. All nine quality criteria impact categories have been analysed. The impact categories are given in the figure below.



**Figure. Categories of quality criteria**

The main questions for each criterion are as follows:

1. How **important** is this criterion in assessing the quality of EES?
2. Is the criterion **specific** enough?
3. Is it possible to provide **evidence** (documents, references in contracts, measured data etc.) to assess the criterion?
4. How **time consuming** is the assessment of this criterion?
5. How many criteria have been used in the project?

## 3.1 Importance of the criterion

Respondents were asked to identify the most important criteria. The Client focussed on Communication as the single most important factor, the EPC provider highlighted a top three, and the Facilitator identified the three key aspects of each criterion.

### Client

**QC6 – Communication:** The client focussed purely on the importance of communication in the project. Regular site meetings, reporting and verbal contact between the Client and Contractor were imperative to ensure that issues could be raised and dealt with quickly, as well as providing useful stakeholder and building user engagement so the works were well received. An area that was highlighted was the importance of change management. As the works progressed it became apparent that certain components of the scope of works needed to change. As well as understanding the practical aspects of the changes it was important that the client had transparent information on the impact to the expected energy / financial savings, such that the parties could adjust the savings guarantee accordingly.

### EPC Provider:

1. QC1 – Analysis
2. QC2 – Implementation & Commissioning
3. QC3 – Savings Guarantee

### Facilitator:

The facilitator took a different approach to providing feedback to this question and highlighted the most important aspects / sub-criteria for each criterion.

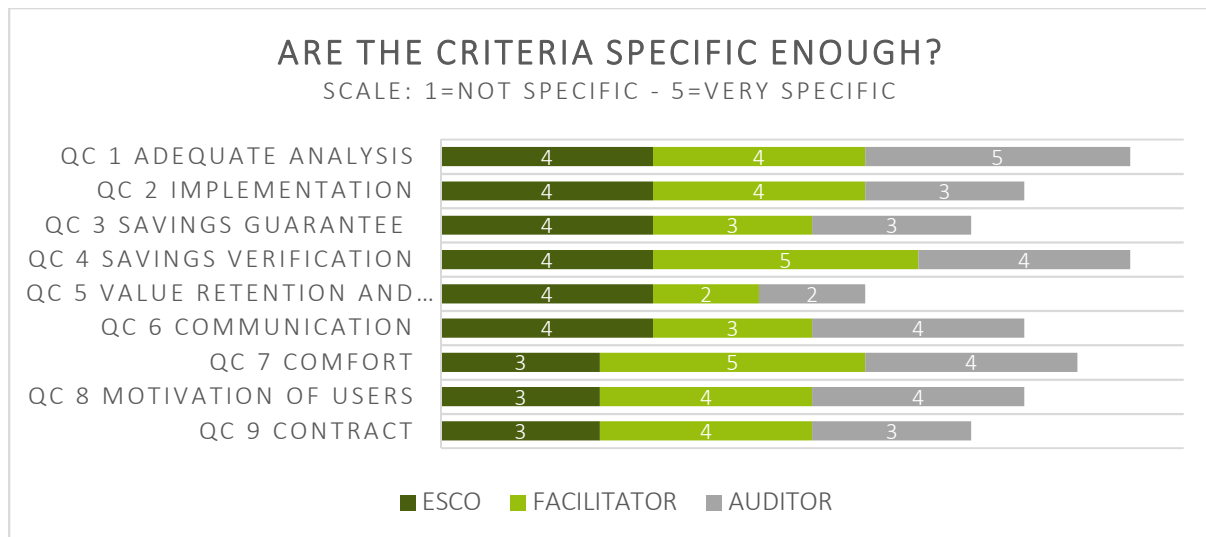
- **QC1 – Analysis**
  1. Robust approach to audits and reports
  2. Clear reporting with appropriate data analytics which show interdependencies of proposals
  3. Transparency of proposals/calculations
- **QC2 – Implementation & Commissioning**
  1. Commissioning and certification of completed works to agreed standards
  2. Clear training and handover plan identifying responsibilities in operation
  3. Communication plans
- **QC4 – Verification**
  1. Clear project specific M&V plan and example savings report to industry standards which is agreed prior to signing contracts/starting work
  2. Agreed baseline with clarity on process to agreeing this with the Client i.e. sign off of the base conditions as well as the base consumption
  3. Agreed responsibilities during the operational period related to data collection, reporting, maintenance

- **QC5 – Operations & Maintenance**
  1. Clear service specification for any services carried out (maintenance, lifecycle, controls etc.)
- **QC6 – Communication**
  1. Clear lines of communication are crucial throughout the project between all parties
  2. 'Leads' for each organisation are key for central points of contact/governance
  3. The importance of building user engagement should not be underestimated
- **QC9 – Contract**
  1. Insurances
  2. Access rights

The following sections 3.2, 3.3 & 3.4 review the feasibility / ease of using the criteria to evaluate Energy Performance Contracting projects – mainly for the purpose of auditing under a quality assurance scheme.

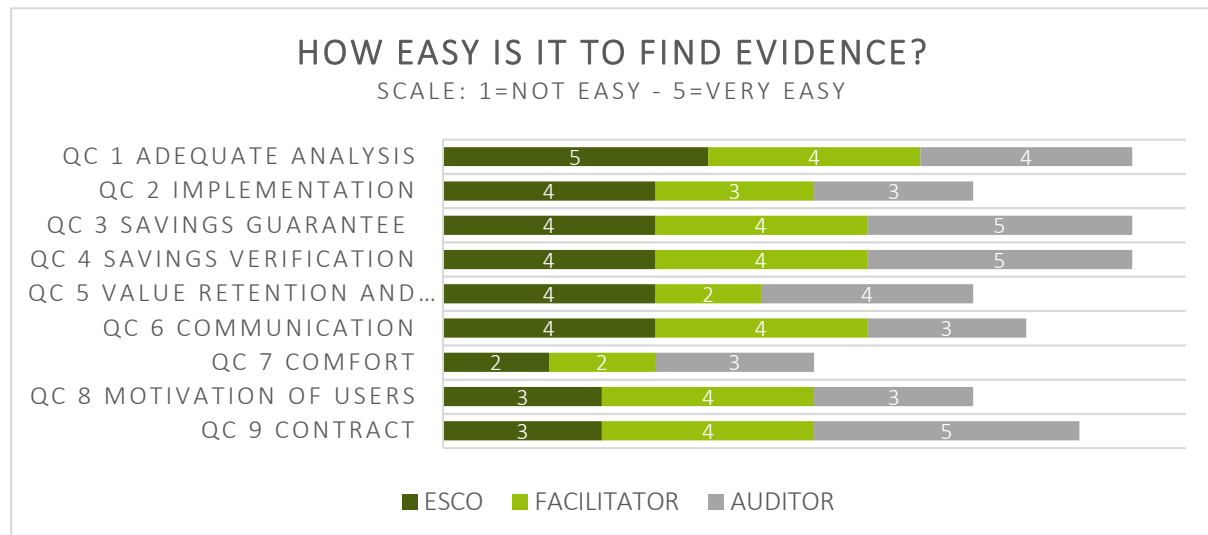
### 3.2 Are the criteria specific enough?

Participants were asked to evaluate each criterion by rating them from not specific (1) to very specific (5) for the purpose of evaluating an EPC project. Answers have been summarised in the figure below. The “Auditor” is introduced in section 3.5.



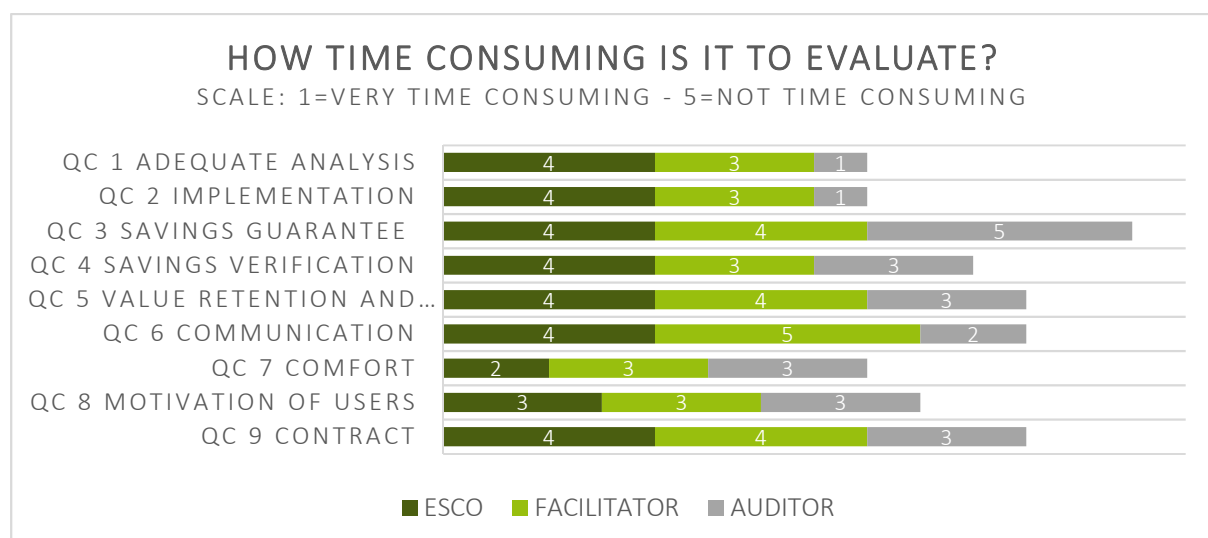
### 3.3 How easy is it to provide evidence?

Feedback was also collected with the aim to evaluate the ease of availability of evidence – documents, references in the contract, measured data etc. – to assess a specific criterion. Respondents were asked to evaluate each criterion each criterion from not possible at all (1) to easily possible (5) to find evidence. The answers have been summarised in the figure below.



### 3.4 How time consuming is the assessment of the criteria?

Respondents rated each impact categories from very time consuming (1) to not time-consuming (5). Answers have been summarised in the figure below.



## 3.5 Trial assessment for proposed quality assurance scheme

### 3.5.1 Purpose

This pilot project was used to test the process of auditing a project for the purposes of the proposed UK quality assurance scheme for Energy Performance Contracting. In the proposed scheme, every two years each EPC provider submits a project in operation – i.e. past the first verification point – for auditing, to maintain their accreditation. The proposed scheme owner – the Energy Services and Technology Association (ESTA) – appoints an independent auditor to review the project against the quality criteria in one process. This has been designed to minimise auditing costs / complexity and address the identified market need for independently audited projects in operation.

A trial assessment has been conducted in this pilot project, with EEVS acting as the auditor (noting that the auditor is not the same as the M&V Professional from EEVS that delivered the M&V Service in the project). The purpose of this was primarily to:

- ✔ Assess the time requirement to conduct the audit, so that the scope of works can be understood and to estimate likely costs for business planning.
- ✔ Understand the feasibility of auditing a project at later stage – can sufficient evidence be found to adequately assess the project against all criteria
- ✔ Identify the key documents that are typically required for auditing so a list can be provided to EPC providers submitting projects. As the collection of evidence is usually a time-consuming step a list of documentation that EPC providers must submit to proceed with auditing is anticipated to reduce auditing time and associated costs.

### 3.5.2 Outcomes

- ✔ The testing identified that it takes around **3-4 days** to audit a project of this size.
- ✔ The areas that take the longest to audit are;
  - 1-3 - Adequacy of derivation of energy efficiency improvement measures. This requires detailed assessment of calculations for each measure, review of proportionality, reasonableness of assumptions etc. Although the EPC provider had provided detailed evidence for the project this was found to be very time consuming as the project had several different types of measures and facilities.
  - 2-1 – Assessment of whether standards for implementation were met, which was found to be time consuming for the same reason as above.

It is recommended that auditors take a sample approach, focused on the most significant measures in terms of energy / cost saving.

- ✔ In this project, the majority of criteria could be easily evidenced with documentation, although the auditor noted that this was a notably well-documented project.
- ✔ Although it was not carried out in this case, it is recommended that a site visit takes place to support the auditing of the quality of implementation works.

### 3.5.3 List of documentation required for audit

The following offers a draft list of minimum documentation that should be provided for audit:

- ✔ Project / tender specification
- ✔ Energy audit / project development agreement
- ✔ Energy audit report / investment grade proposal and supporting calculations
- ✔ Measurement & Verification Report and supporting calculations
- ✔ Project implementation plan
- ✔ Energy Performance Contract (and construction contract where relevant)
- ✔ Technical / design documentation
- ✔ Progress / site meeting minutes
- ✔ Operation & maintenance manuals
- ✔ Training & handover documentation
- ✔ Commissioning / testing sheets
- ✔ Savings report

## 3.6 Lessons learned from consultations and pilot projects

### 3.6.1 General Feedback

- ✔ Most of the criteria were relevant to the project except;
  - QC5 – was only partly relevant as most of the operations and maintenance responsibility was transferred to the Client at the end of the defects liability period of the construction works. It was noted, however, that clear definition of responsibilities

and detailed O&M manuals, training and handover activities are all still very important in this case.

- QC8 – information and motivation of users was not really relevant to this project as the project did not include this ‘behavioural change’ as part of the scope of energy conservation measures.

It was recommended that these criteria should become optional.

- ✔ In this project it was noted that many of the criteria surrounding specification and contract definition were developed by the Client and Facilitator rather than the Contractor. The evaluation in the quality assurance scheme, however, focusses on assessing the quality of the Contractor only. It was noted that there were no issues with the work completed by the Client / Facilitator in this case, however the case of a poorer specification and contract was discussed – should the Contractor be penalised for issues that relate to aspects that were not in their control? It was agreed that the Contractor has a responsibility to drive good practice regardless of the quality of specification / contract presented to them, so these criteria were still relevant even if they were not initially responsible for them.
- ✔ Clients are often nervous about specifying trade association memberships / related accreditations as there is often a level of politics within trade associations. There are often providers that choose not to join certain trade associations. Also, these types of accreditation cannot be specified in public procurement.
- ✔ From a client perspective it is not helpful on a project level to audit a completed project. It was noted that this necessary for the design of the scheme but clients may benefit from associated application guides or ‘health checks’ throughout the process.
- ✔ This also means that provision of information for verification should be Contractor led, particularly as they are the one applying for accreditation. It may be difficult to ask for Clients’ time if there are limited benefits beyond review of lessons learnt for future projects.
- ✔ It was discussed whether a quality assurance scheme that focusses on audit of Contractors with projects in operation potentially creates a barrier to entry for new EPC providers. It was noted that this was a potential risk however, in some respects the proposed scheme is looking at distinguishing experienced providers rather than excluding new providers.



### 3.6.2 Interaction with existing Frameworks

- ✔ There was discussion around the extent to which Frameworks already cover a level of quality assurance and whether this would be duplication where a Framework is used.
- ✔ Should frameworks be accredited to streamline the auditing process?
- ✔ Can the quality criteria be used to offer a level of auditing for Framework / Client – to align the specification and tender process with the criteria?
- ✔ Can both public sector Frameworks and the Qualitee initiative benefit from collaboration?  
For example, establishing accreditations such as Qualitee as advantageous evaluation criteria for tenderers to join a framework and / or respond to project tender.

### 3.6.3 Specific feedback

Specific feedback focussed on criteria that were missing or could benefit from improvement. The feedback is summarised in the following table.

Criterion	Topic	Feedback
1-1	Auditing Standards	The criteria should reference ISO50002 as well as EN16247, as the former is becoming more widely recognised in the UK.
1-3	Dynamic models	It was agreed that using dynamic simulation tools in the derivation of energy conservation measures was not necessary for this project and should be considered optional in most cases, except where detailed heat modelling is required, or in the case of deep renovation. It was commented that dynamic simulation is only as good as the data input and results can be misleading, and can add unnecessary cost to a project. Where dynamic simulation modelling is used, the qualifications / experience / accreditations of the individual(s) carrying out the modelling should conform with high level of competency requirements, e.g. use of IES VE HVAC Analysis / ASHRAE 90.1
1 / 2	Risk assessment / registers [missing]	Risk assessment and mitigation is key to smooth project delivery. This starts at the analysis / business case stage where the feasibility of ECMs must be assessed against key risks that may stop them going ahead entirely such as presence of asbestos, or planning constraints. Full risk assessment is also expected during the implementation phase. Criteria could focus around availability of a risk register and action taken to regularly review the risks, and find solutions for mitigation.

Criterion	Topic	Feedback
2	Health & Safety [missing]	Further criteria on Health & Safety are required. This is very important area, particularly for the Client in the UK.
2	Other missing criteria	Resourcing plan, subcontractor selection and management process.
2-1	Implementation standards	It was commented that it is important to define where client standards deviate from published standards. In many cases these will be more stringent, but in some cases, it may be agreed to lower standards through a derogation list. For example, an energy efficiency project may only be financially feasible where like for like replacement is considered, even if the final works do not achieve the full list of standards originally specified by the client.
2-4/5	Training, handover and clarity of O&M responsibility	Noted to be covered in the criteria, but could be brought out to be more significant.
3-1	Guarantee Types	Guarantee in NDEEF D&B does not meet criteria of commensurate remuneration as the performance retention is not related to the level of underperformance. Despite this, the Client felt the guarantee was sufficiently robust as, for capital works focussed measures, you get a good feel for savings over first year so providing maintenance handover is well managed felt there was lower risk that savings will not persist. There was concern, however, around soft savings such as BMS optimisation persisting after first year. It was discussed that this could become a type three guarantee if it is backed up by strong O&M manuals, handover and warranties.
3-2	Performance against guarantee	It was discussed as to what qualifies as a pass here – only where 100% savings met. Could projects which underperform but the ESCO carries out successful remediation, be considered as a pass?
4	Reporting format	Add further criteria around definition and agreement of reporting format.
6	Communication	Generally it was noted that the clarity of this criterion could be improved.
6-3	Change management	This criterion could be adapted to also capture how changes to the scope of works and guaranteed values are managed.
7	Comfort	It was discussed that relying on user feedback for the assessment of adequate environmental conditions was challenging as user feedback is often subjective. It was

Criterion	Topic	Feedback
		<p>agreed that this criterion would be better focussed on evaluating baseline conditions and monitoring of conditions – where relevant - during the contract (light levels, temperature, humidity, air quality / CO<sub>2</sub> etc.) to ensure required improvements or standards are met.</p> <p>Consideration should be given to developing a qualitative description of the aspects of comfort conditions affected by ECMs – prior to and after intervention. For example, listing areas that are overheated and whether the ECM is intended to improve comfort conditions and to what extent this is expect to support / erode savings. Contractors should not be penalised if an un-heatable space becomes heatable and the client operates the space and its systems to improve comfort rather than save energy. Equally, the Contractor should not install measures whose primary benefit and justification is to improve comfort conditions if they have only been instructed to implement ECMs.</p>

## 4 CONCLUSIONS

A piloting exercise was carried out to evaluate the draft European technical quality criteria for Energy Efficiency Services in a real world Energy Performance Contracting project between Dundee City Council, the client, and their selected Contractor – Vital Energi. The purpose of the piloting exercise was to provide critical feedback to feed into the adaptation of the criteria for the UK context, and to evaluate the feasibility of current proposals for a UK quality assurance scheme for EPC.

This pilot project specifically evaluated the feasibility of conducting a single audit to assess a project in operation using the quality criteria. It was found to be feasible in 3-4 days (in this case less than 0.2% of contract value), providing that project documentation was well organised and that a sample / spot check approach could be taken for more time-consuming evaluation of areas such as evaluation of savings projection calculations and whether implementation standards have been met.

The feedback highlighted the importance of communication to the success of Energy Performance Contracting. Regular reporting, site / progress meetings and clear / transparent project manuals with details for lead contacts was seen as imperative to effective troubleshooting and change management. This was highlighted as a major success factor in this project between Dundee City Council and Vital Energi.

It was noted that QC5 (O&M) and QC8 (Motivation of users) were not entirely relevant to this project, and this is expected to be the case for many projects. Therefore, it was recommended that these criteria are made optional.

The pilot testing revealed that there is another type of savings guarantee that does not fit into the current criteria set. This guarantee type – a savings performance retention where performance measurement is limited to 12 months to release a performance retention of 15% of contract value – was considered to be sufficiently robust by the client, providing that this is supported operation & maintenance manuals, training, handover and extended warranties.